

An Unprecedented Rabies Investigation

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Outline

- Background
- Human Rabies investigation
- Oral Rabies Vaccination Program

Background

History of Rabies in Texas

- Mid-1800s: First accounts by cowboys
 - Attacked by “hydrophobia” cats (rabid spotted skunks)
- 1884: Pasteur developed rabies vaccine
- 1903: Staining test to detect Negri bodies
- 1946: Gray fox rabies first appears in Texas, Sabine Co.; epizootic began
- Late 1940s: Vets recommended vax of dogs
- 1953: Primary control of epizootic: reduction of fox population

Transmission

- Reservoirs

- Animals, humans

- Routes of Transmission

- Bite of an infected animal via saliva
 - Contamination of mucous membranes (eyes, nose, mouth)
 - Aerosol, airborne
 - Corneal transplantations
 - Solid organ transplantation (Texas 2004 and Maryland 2013)
 - Animal to animal;
 - Animal to human (zoonosis)

Pathogenicity

Virus incubates 3-12 wks

Spreads through nerves to spinal cord and brain



Reaches brain; multiplies; virus passes to salivary glands; becomes symptomatic

Virus enters through saliva

Bitten by rabid animal

Dies within 7 days of illness onset

History of rabies treatment

- In the olden days....
 - Bite victims would ride until they found a madstone for rabies
- Madstones
 - Wad of partially digested food from white deer or buckskin
 - Vegetable matter
- Method
 - Adhere madstone to bite to draw out rabies “poison”
 - Placed in warm or hot milk; turned green from poison
 - Gastric contents then reapplied to bite; therapeutic

Treatment & Prophylaxis

- NO treatment once symptoms begin
- Postexposure prophylaxis
 - Immune globulin (IG) at day 0
 - Site of bite (if any)
 - Vaccine at days 0, 3, 7, and 14
- Information needed to receive PEP
 - Rx from physician
 - Cooler for transportation of vax and IG
 - Current weight (IG)

Passive Immunization

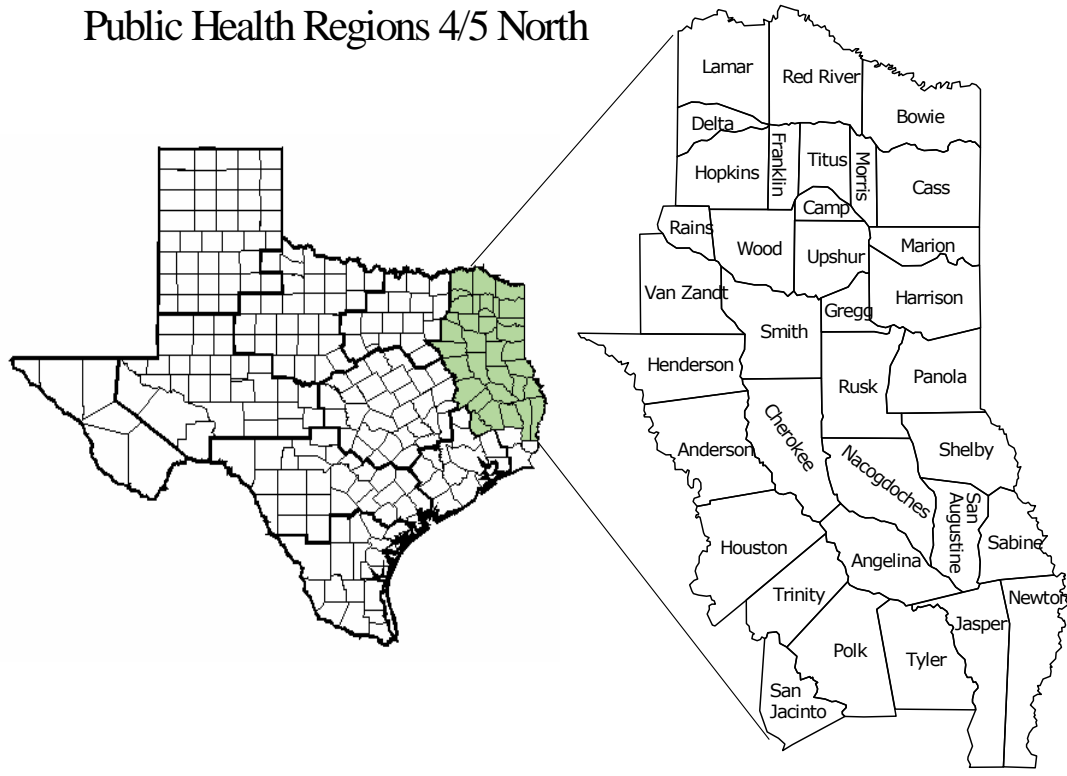
Active Immunization



Human Rabies Investigation East Texas, 2004

East Texas

Public Health Regions 4/5 North



- 35 Counties
- 25,000 sq. miles
- Borders 3 states
- 1.3 million people
- 9 Local Health Depts.
- 42 hospitals

Unfolding Events



June 30, 2004
(Wednesday)

1:15 PM

Timeline



- June 30, 2004 (Wednesday)
 - CDC confirms diagnoses of rabies
 - CDC notifies Texas Department of Health
 - 1:15 PM HSR 4/5N notified of event

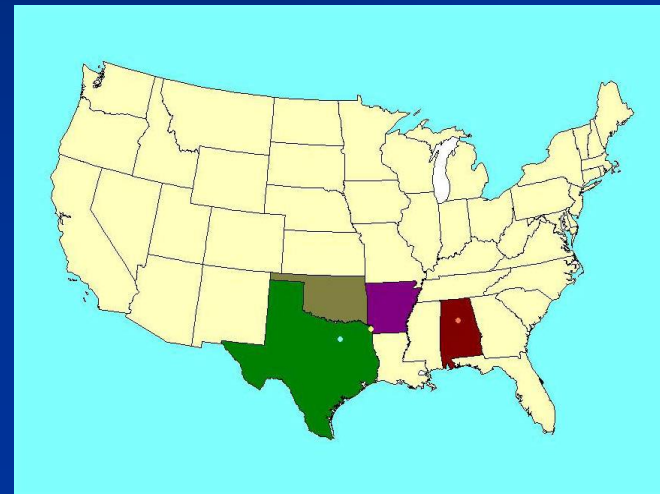
Human Rabies CaseS in Texas

CDC conference call

2:00 PM

The Call...

- 3 human rabies deaths
- All patients were organ transplant recipients
- 4 states (TX, AK, OK, AL)
- Donor
 - Arkansas resident
 - Seen at 2 hospitals in Texarkana, TX
 - Died of rabies
 - Organs used for transplant
 - Liver
 - Kidneys
 - Lung



Organ Donor

- Severe mental status changes and low-grade fever; neurologic imaging consistent with subarachnoid hemorrhage
 - Expanded in 48 hrs of admit
 - Led to cerebral herniation and death
- Donor eligibility screening and testing
 - No contraindications for transplantation

Transplantation

- Organs donated (May 4, 2004)
 - Lung
 - Recipient died on operating table (Alabama)
 - 2 kidneys
 - **Male: Deceased 06-08-04 (Texas)**
 - Female: Deceased 06-21-04 (Texas)
 - Liver
 - Deceased 06-07-04 (Oklahoma)

Male kidney recipient

- 18 y.o., Resident of Gilmer, TX
- End-stage renal disease with glomerulosclerosis
- Discharged 12 days after transplantation
- Graduated high school---"new lease on life"
 - Attended parties with all of his friends
- 27 days after transplantation, he visited emergency room
 - Transferred to transplant center with myoclonic jerks and altered mental status
 - 10 days after admission, diffuse edema in brain; subsequently died

Regional Response



Action Plan

- Form Response Team
 - Paul McGaha, DO, MPH
 - James Wright, DVM, MPVM
 - Tabatha Powell, MPH
 - Angela Hopkins, BAA
- Conduct Exposure Assessments
 - Coordinate with health department staff
 - Develop assessment tool
 - Assess exposure of hospital staff and recipient's family/friends
 - Facilitate PEP

July 1, 2004
(Thursday)



Team travels to Texarkana, TX

2.5 hr drive

Timeline

- July 1, 2004 (Thursday)
 - 6:00 AM Depart for Texarkana
 - 10:00 AM Meet with Texarkana-Bowie and Miller Co. (AR) HDs
 - Afternoon Conduct hospital staff exposure assessments
 - 9:00 PM Team divides efforts
Develop Family/Friend Assessment tool

Response Efforts



- Coordinated exposure assessments with hospital staff in Texarkana hospitals
- Provided HRIG and vaccine
- Facilitated management and administration of PEP
- Participated in CDC briefings/conference calls
- Provided updates to both state HDs

Exposure Assessments

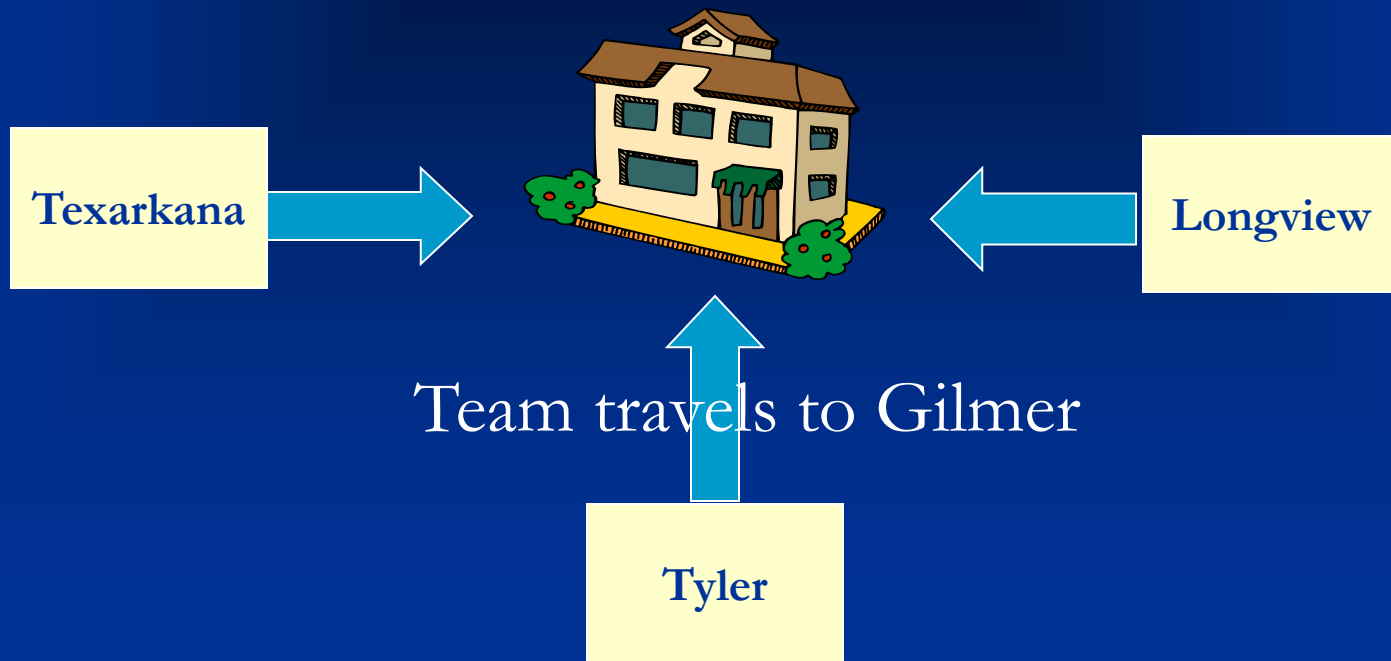
- 2 hospitals in Texarkana
- Held meeting with hospital staff
 - Coordinated with ICP
- Assessed exposures of hospital staff
- Provided PEP

FAMILY AND FRIEND RABIES EXPOSURE QUESTIONNAIRE	
Relationship to patient: <input type="checkbox"/> Immediate family <input type="checkbox"/> Relative <input type="checkbox"/> Friend <input type="checkbox"/> Sexual Contact	
Last Name: _____	First Name: _____
Address: _____	Home Phone: _____ Work Phone: _____ Cell Phone: _____
City: _____	Zip Code: _____
1. Sex: M F Age (years) _____	
2. Were you in physical contact with the patient or his/her bodily secretions while he was in the hospital?	
No _____ Yes _____	
If YES, Briefly describe your interactions with the patient. _____ _____ _____	
3. Were you in physical contact with the patient or his/her bodily secretions during the time following his hospital stay (05/16-05/30)?	
No _____ Yes _____	

Assessment Form

- Contact with patient's fluids or secretions?
 - ☐ Saliva
 - ☐ Cerebrospinal fluid
 - ☐ Sputum
 - ☐ Vomitus
 - ☐ Tears
 - ☐ Urine sediment
- ✚ Fresh wound, cut, or other break in skin that may have come in contact with the patient's secretions?
- ✚ Patient's secretions in contact with your eyes, mouth, or nose (mucous membranes)?
- ✚ Bitten by patient?
- ✚ Previously vaccinated for rabies?

July 2, 2004
(Friday)



Timeline

- July 2, 2004 (Friday)
 - 9:00 AM
 - Meeting with family and friends of kidney recipient
 - 10:00 AM - 6:30 PM
 - Exposure assessments completed
 - Facilitated PEP
 - Interviewed family to record course of disease
 - Reviewed forms
 - Assessed exposure of staff from 3rd hospital involved

Exposure Assessments

- Were you involved in any of the following activities with the patient during....?
 - Sharing eating utensils
 - Sharing drinking glass
 - Sharing a cigarette
 - Sharing food
 - Sexual contact
 - Kissing on face
 - Kissing on mouth
 - Kissing with saliva exchange
- Describe typical interactions with patient

PEP



Treatment of Contacts

- Prophylactic treatment
 - Immune globulin at day 0
 - Vaccine at days 0, 3, 7, 14, and 28
- Information needed to receive PEP
 - Rx from physician (local physician recruited)
 - Cooler for transportation
 - Current weight (IG)



PEP Cost

■ HRIG	\$139.00
■ Vaccine	\$99.00

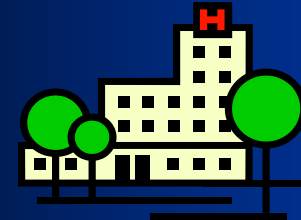
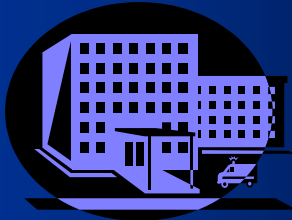


■ For a 170 lb person

- 10.3 ml HRIG= 6 X 2 ml vials @ \$139 = \$834
- 5 vials of rabies vaccine @ \$99 = \$495

\$1329

Potentially Exposed



160 Medical Personnel



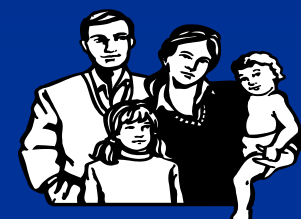
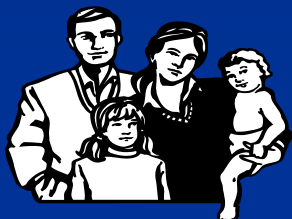
52 w/PEP



30 w/PEP



46 Family and Friends



Cost of Biologicals in East Texas

■ Hospital PEP	\$69,164.40
■ Donor contact PEP	\$12,351.25
■ Friends/Family of kidney recipient	\$33,357.75
	<hr/>
Total	\$114,873.40

July 8, 2004
(Thursday)



Another human rabies case?

A New Case

- Baylor pathologist uncovers similar death
 - Transplant recipient
 - Early May
- Organ donor from Tyler
- Hepatic artery from original Arkansas donor used in transplant

**What was the original Arkansas
donor's exposure??**

Donor Exposure

BAT

High Risk

Since 1980 in the US, 90% of the domestically acquired human rabies cases were from bats.



Outcomes

- A coordinated (multiple state and federal agencies), appropriate, and timely response to an unprecedented event
 - 1st case of human rabies from organ transplantation
- Facilitated and coordinated the distribution of PEP
- Depletion of regional vaccine and IG supply
- Increased calls from public

Acknowledgements

- Texas Department of State Health Services, Health Service Region 45N
 - Paul McGaha, DO, MPH, Regional Director
 - James Wright, DVM, MPVM, Regional Zoonosis Veterinarian
 - Angela Hopkins, BAA, Zoonosis Control Division
 - Tom Sidwa, DVM, Director ORVP
- Texarkana-Bowie County Family Health Center
 - Gary Chaffin
 - Colleen Osterchill

References

- “Investigation of Rabies Infections in Organ Donor and Transplant Recipients—Alabama, Arkansas, Oklahoma, and Texas, 2004.” *MMWR Weekly*. July 9, 2004. 53 (26); 586-589.

Oral Rabies Vaccination Program

- Annual program
- Developed as result of 2 rabies epizootics in 1988
 - Coyotes and dogs (South Texas)
 - Gray foxes (West-Central Texas)
- Drop baits across south and west-central Texas
- Prevent spread of rabies in wildlife populations
 - Coyotes, foxes



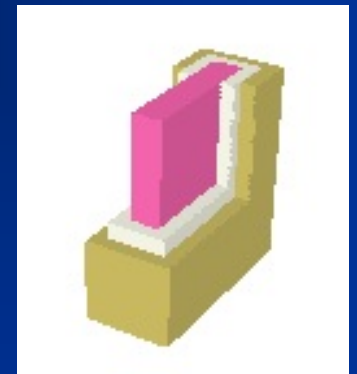
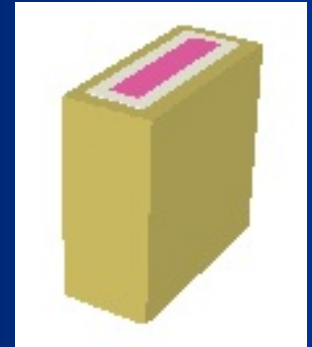
Participating Agencies

- Texas Department of State Health Services
- Texas Wildlife Services
- Texas National Guard
- Dynamic Aviation Group
- Ontario Ministry of Natural Resources
- Merial Limited
- Hills Pet Nutrition
- US Army Veterinary Lab, Fort Sam Houston
- USDA Predator Research Facility, Utah
- Texas A&M University System
- Centers for Disease Control and Prevention
- National Wildlife Research Center
- USDA APHIS
- Texas Parks and Wildlife Department
- US Air Force



Baits

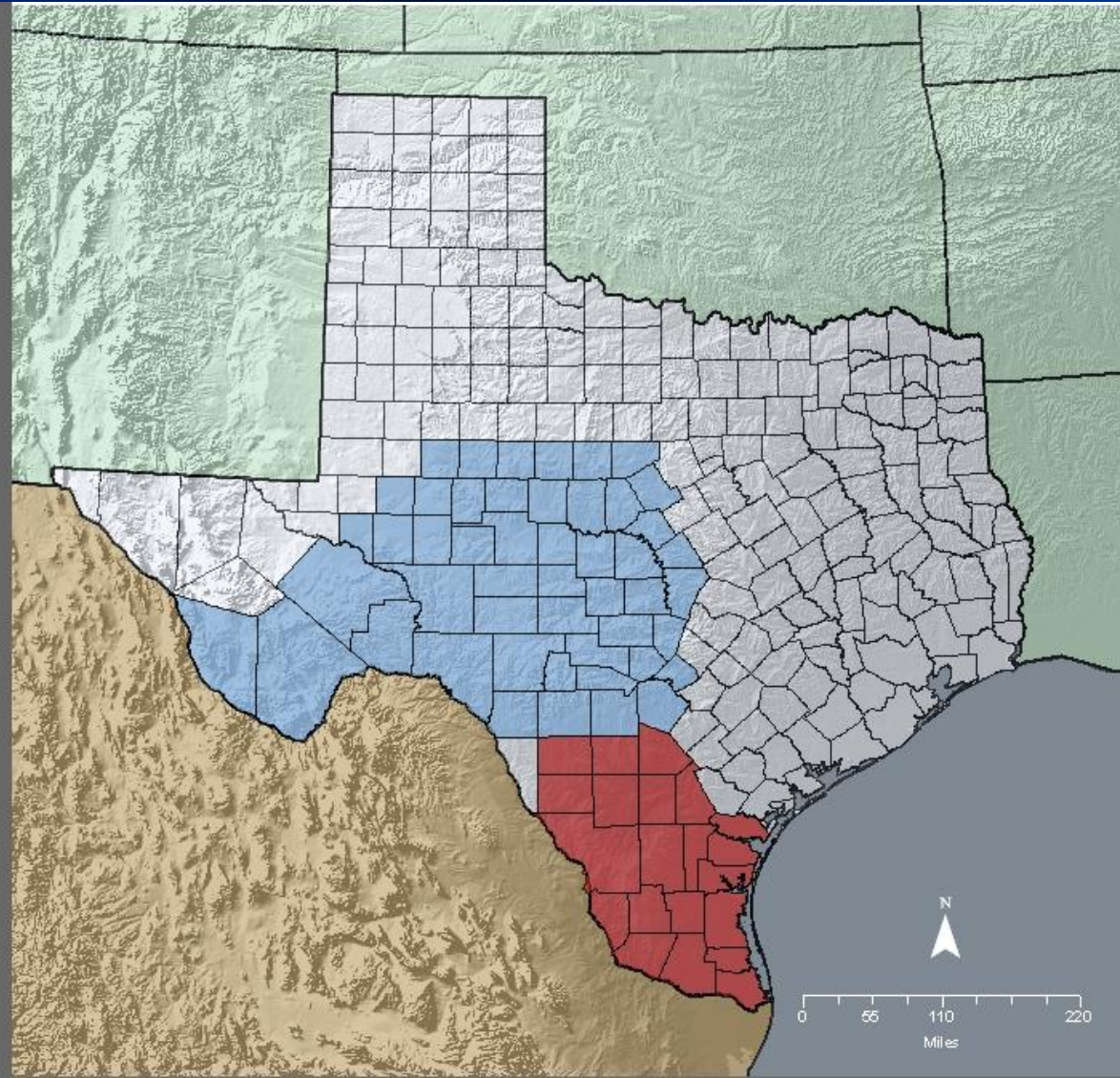
- Composition
 - Fish meal (coyote)
 - Dog food (gray fox)
 - Polymer additive as binding agent
- Low-temp. sealing wax holds vaccine sachet in place
- Contains 2 ml of rabies vaccine
- Includes warning label



Rabies Epizootic Areas



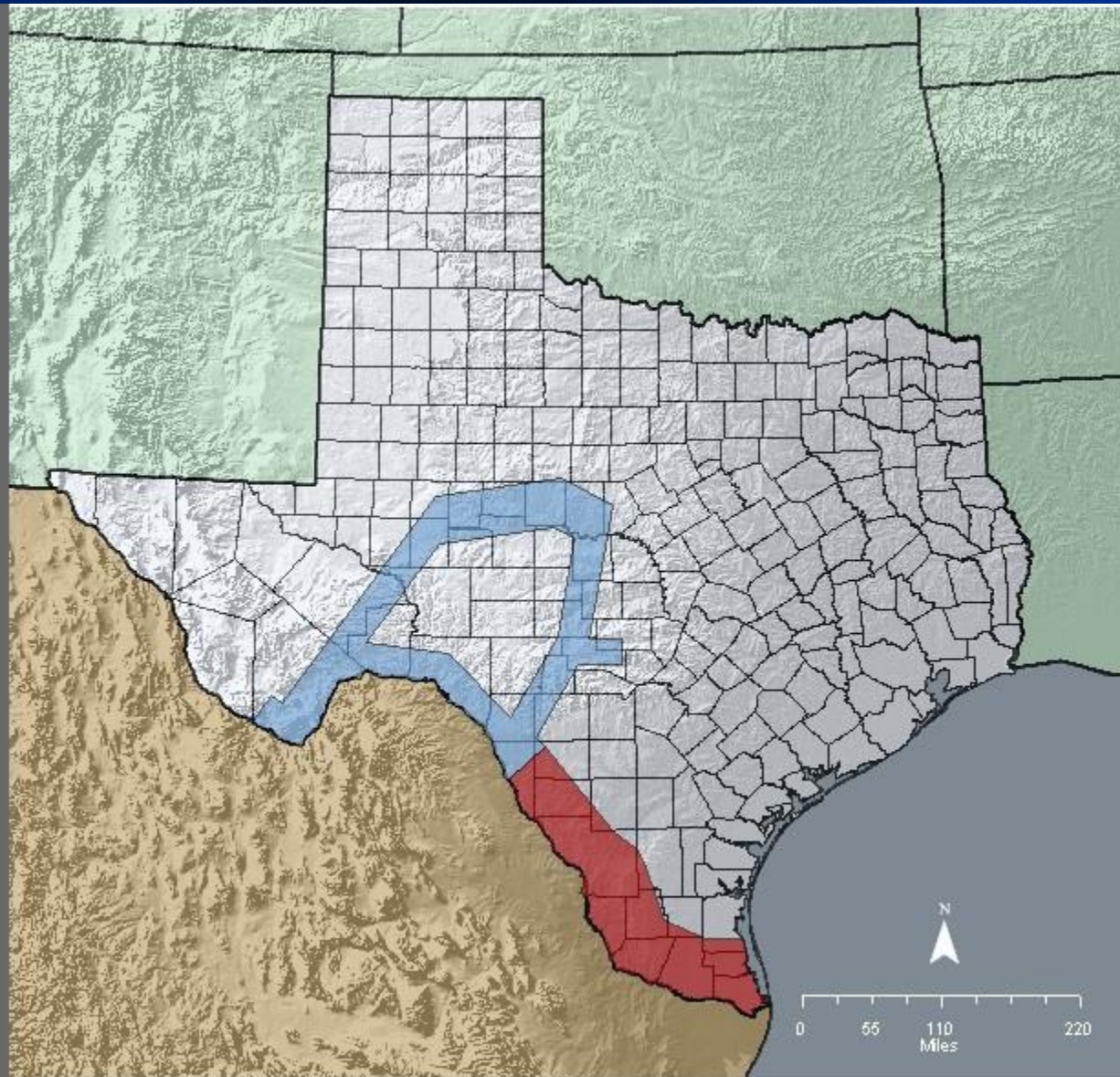
Department of State Health Services
Zoonosis Control Group
Rabies Epizootic Areas

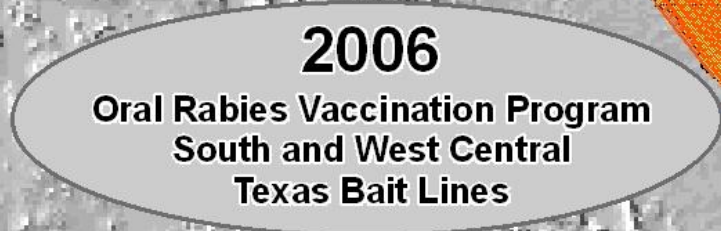


2005



Department of State Health Services
Zoonosis Control Group
2005 Vaccine Distribution Areas





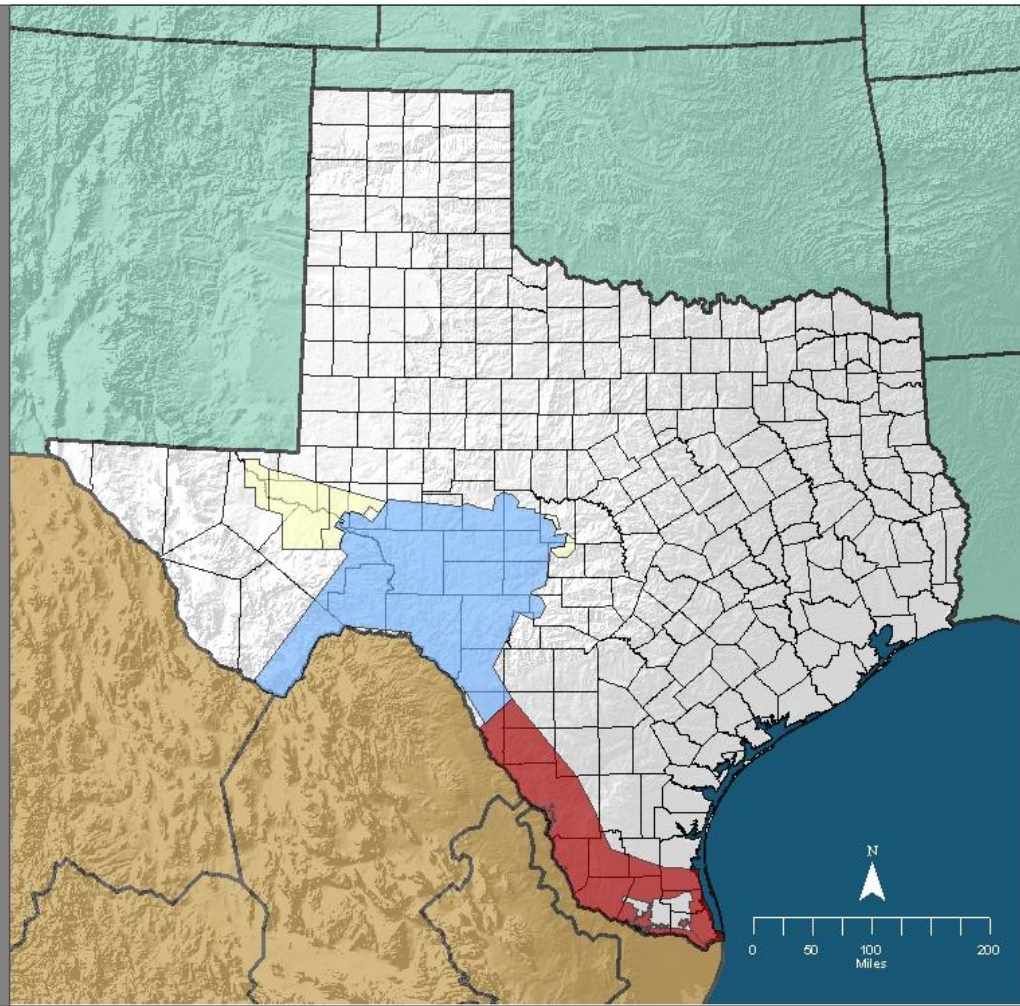
2007



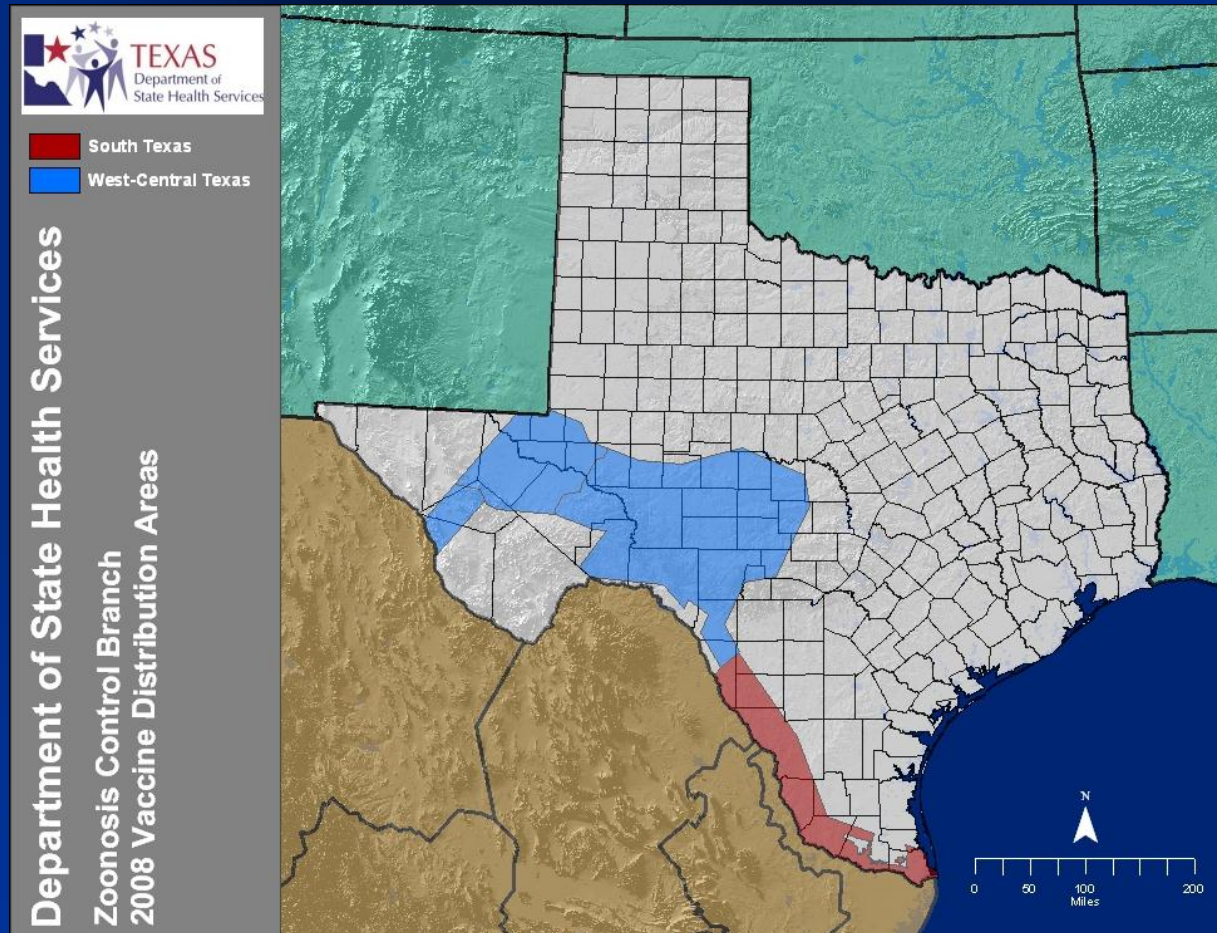
- South Texas
- West-Central Texas
- Supplemental Area

Department of State Health Services

Zoonosis Control Branch
2007 Vaccine Distribution Areas



2008



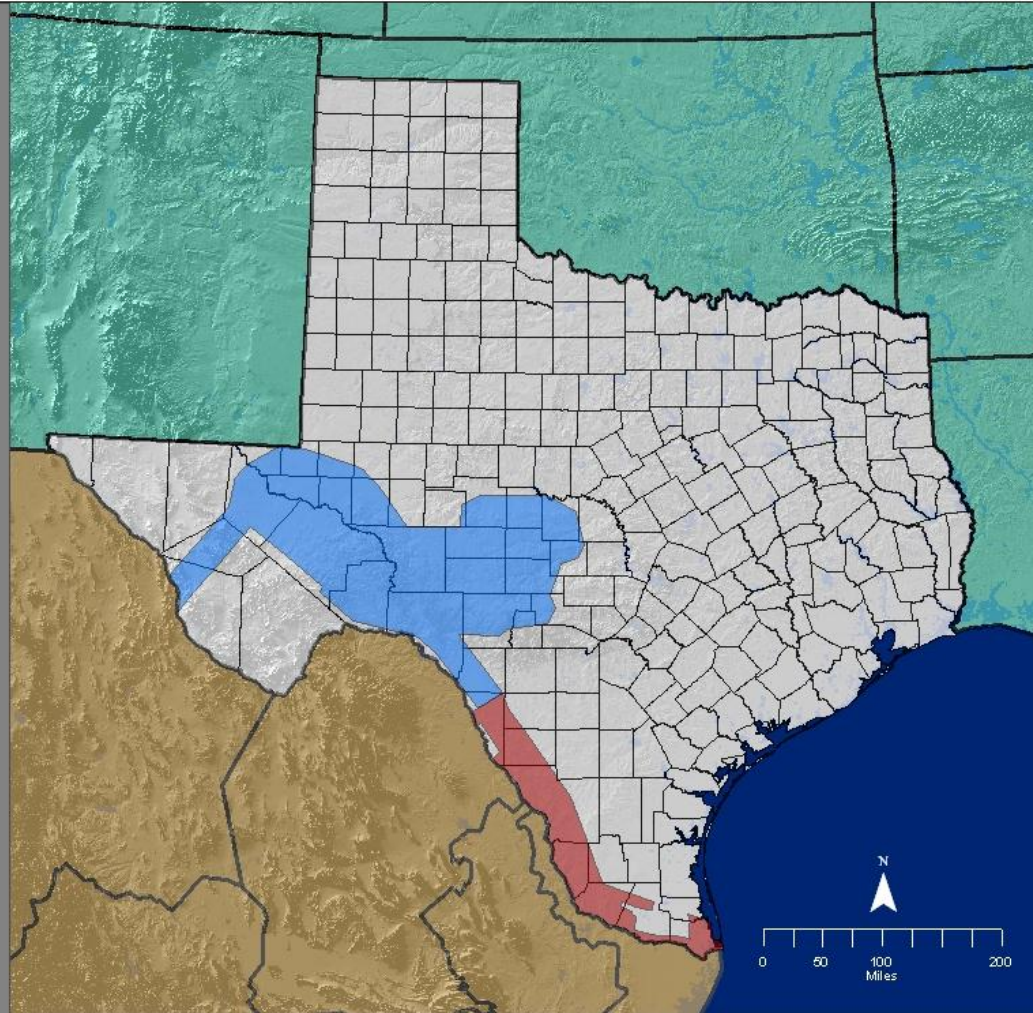
2009



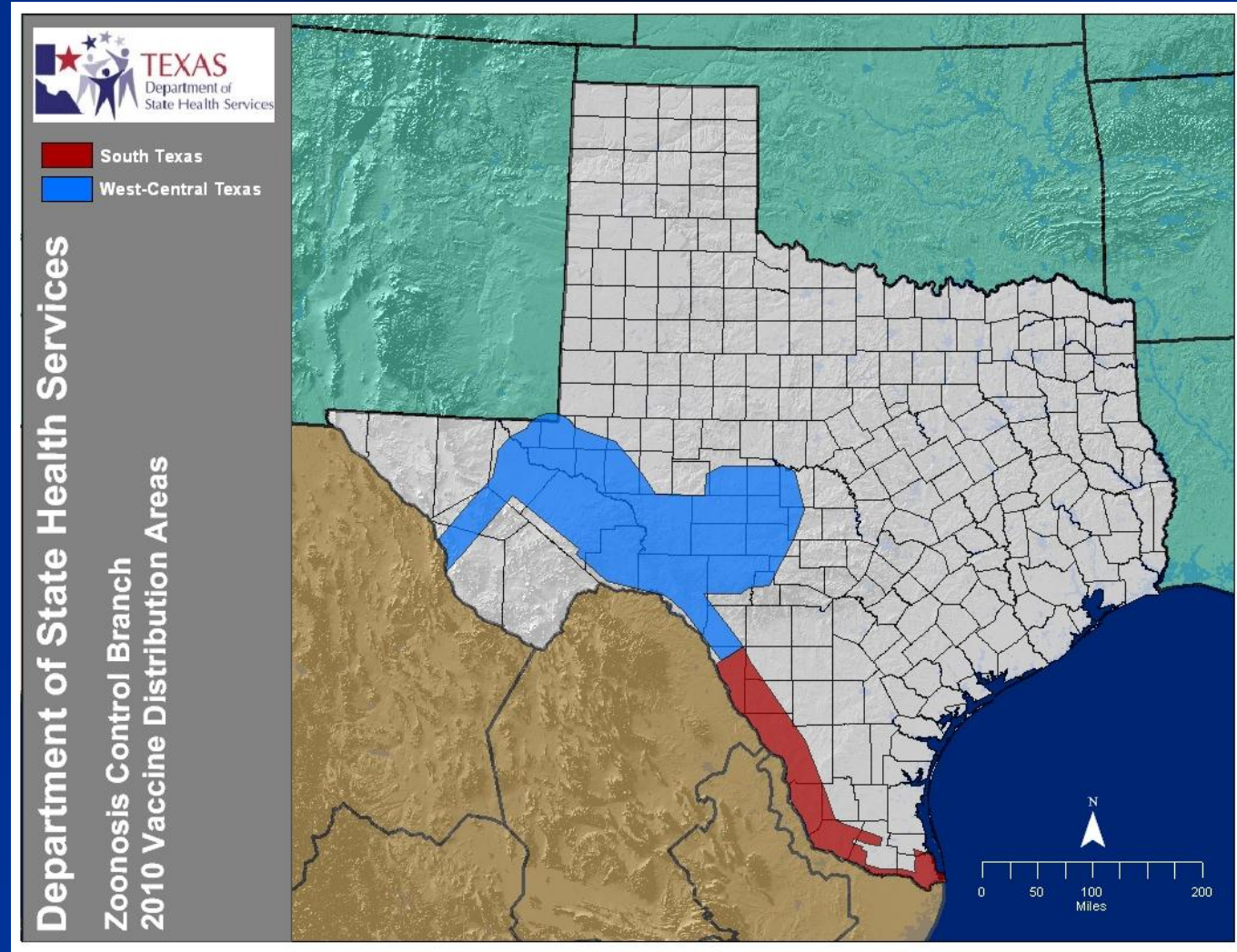
- West-Central Texas
- South Texas

Department of State Health Services

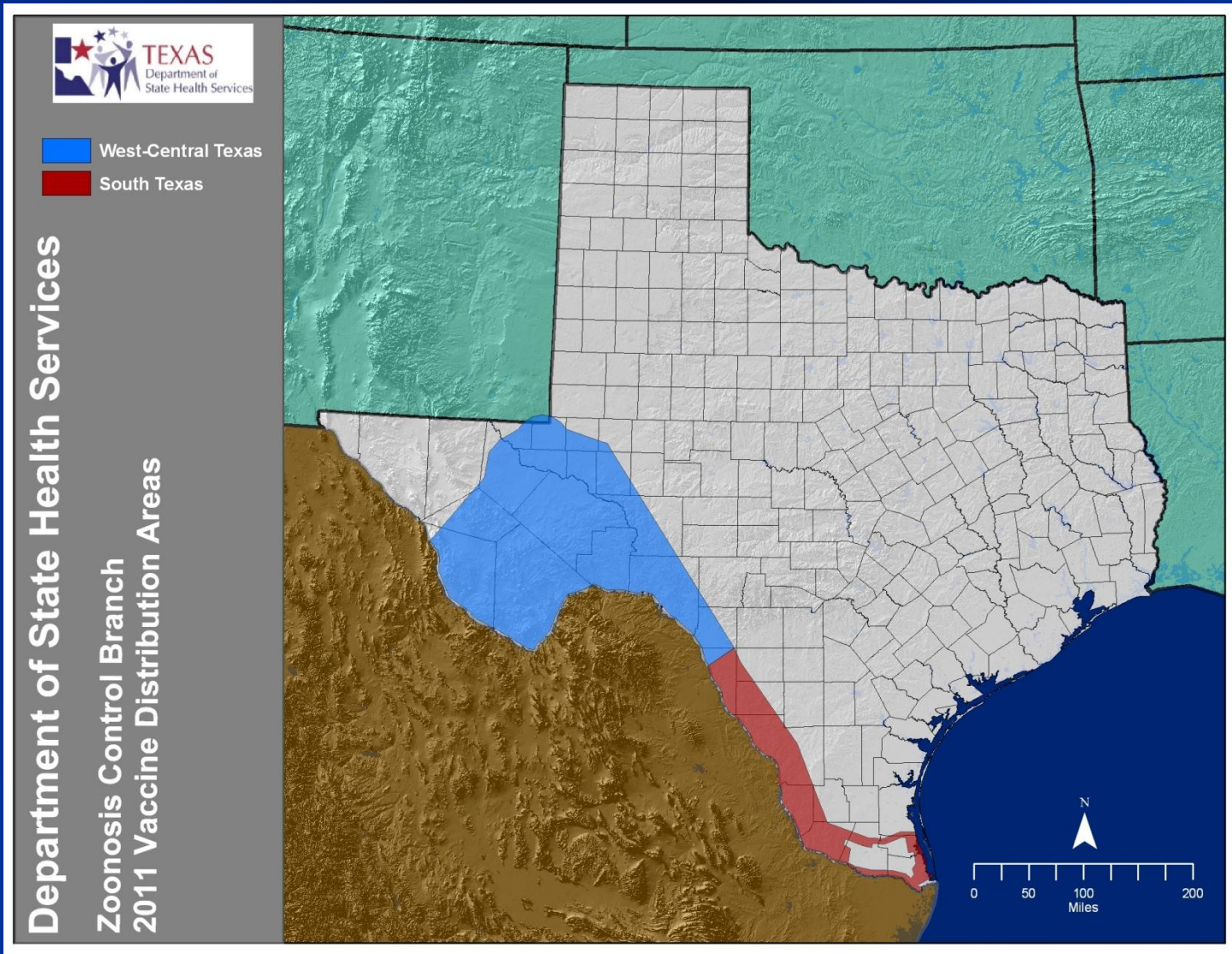
Zoonosis Control Branch
2009 Vaccine Distribution Areas



2010



2011



2012

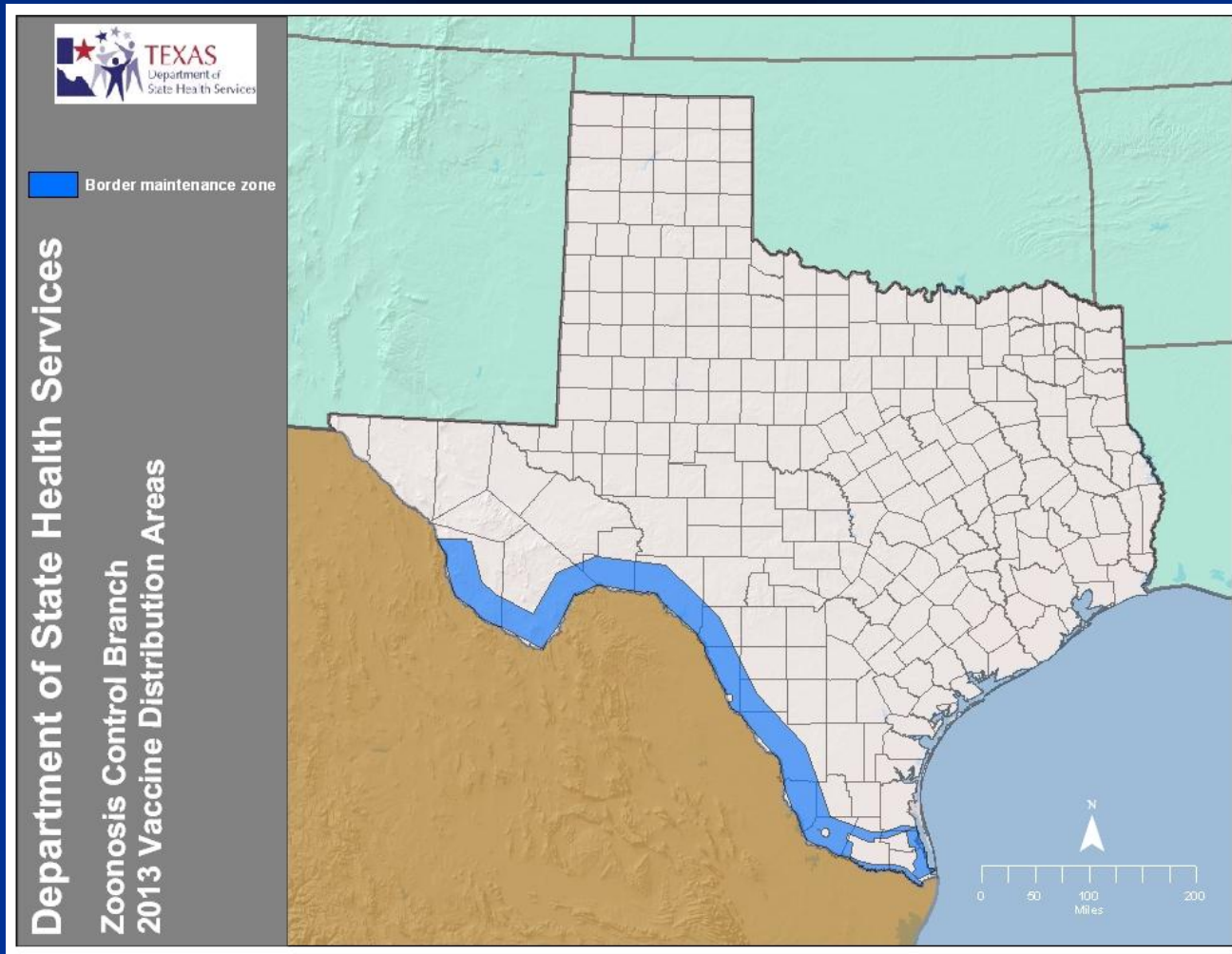


- South Texas
- West-Central Texas

Department of State Health Services
Zoonosis Control Branch
2012 Vaccine Distribution Areas



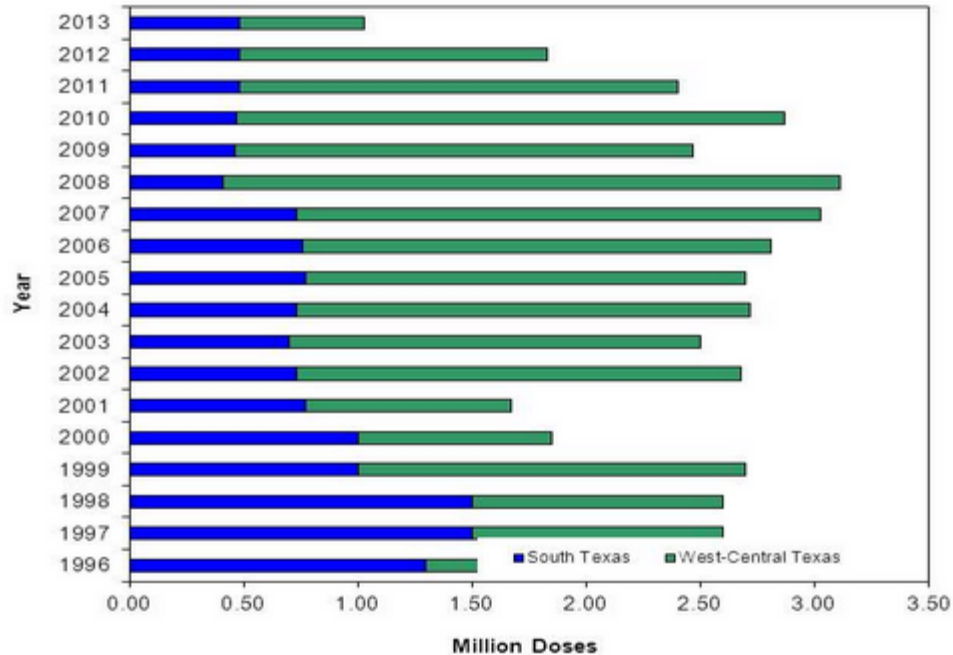
2013



Baits dropped per year



Coyotes



2013

Texas border maintenance zone - 1.02M doses over 16400 square miles

2012

South Texas - 0.48M doses over 7600 square miles

West-Central Texas - 1.35M doses over 21500 square miles

2011

South Texas - 0.48M doses over 7700 square miles

West-Central Texas - 1.92M doses over 30,700 square miles

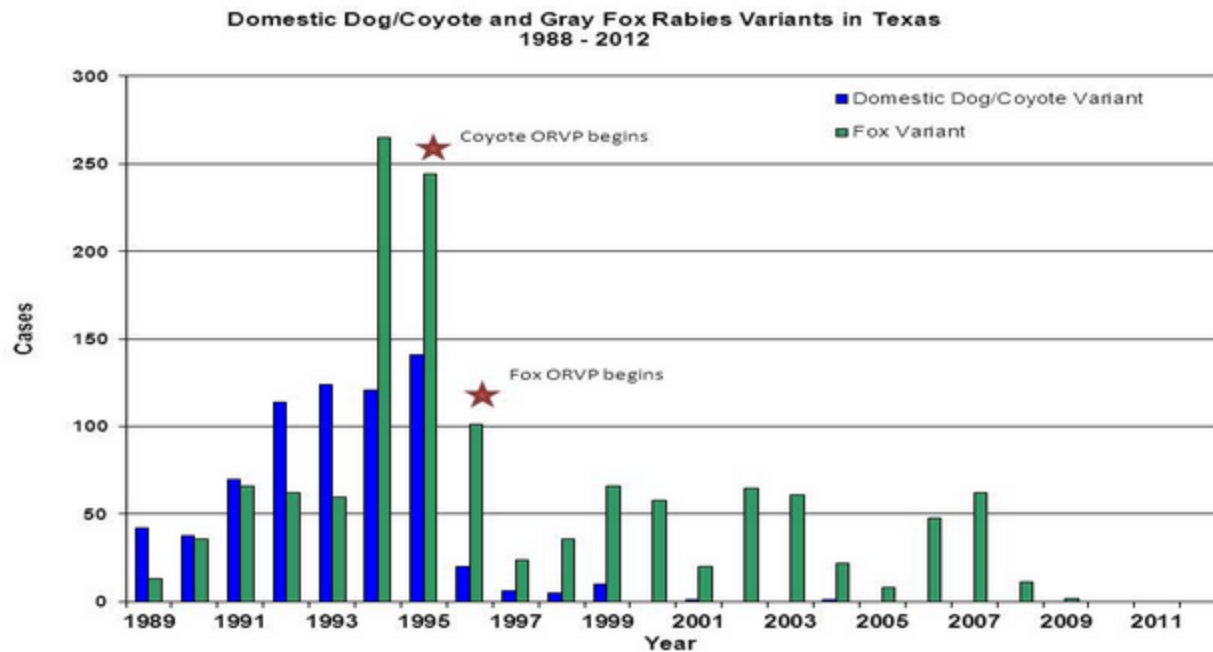
Gray Foxes



Impact

What impact did all this baiting have on rabies in Texas?

- The number of Domestic Dog/Coyote (DDC) reported rabies cases in South Texas went from 141 in 1995 to 0 in 2010.
- The number of Texas Fox (TxFx) reported rabies cases in West-Central Texas went from a 101 in 1996 to 0 in 2010.



Process of dropping bait



The Planes and the air!



The People that make it happen!





Questions??

